THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 28

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DIETER ROLLER

Appeal No. 95-4605
Application 08/076,285[1]

ON BRIEF

Before HAIRSTON, KRASS, and BARRETT, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

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[1] Application for patent filed June 11, 1993, entitled "Method For Generating Graphical Models And Computer Aided Design System," which is a continuation of Application 07/525,101, filed May 17, 1990, now abandoned, which is a continuation-in-part of Application 07/360,494, filed June 2, 1989, now abandoned, which claims the priority benefit under 35 U.S.C. § 119 of EPO Patent Application 89108990.6, filed May 19, 1989.

This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 1-16, all of the claims pending in the application. We affirm-in-part.

The disclosed invention is directed to a computer aided design (CAD) system which includes a replication command which is stored in unexecuted form and the number of replications to be made of a selected structural object is stored as a variable. As described in the Brief (page 2):

> When the generic program containing these variable replication commands is executed to render an output image, the variables need to be substituted with specific values. In general, for execution, a CAD user merely inputs specific values for modifying the shape of a selected object as well as the replication number. In response to these user inputs, the CAD system executes the program and completes the replication of the selected object "on the fly."

Claim 1 is reproduced below.

> 1. A method for generating a generic program of a graphical model of a 2- or 3-dimensional object with at least partially variable dimensions, in a computer aided design system, said design system having design commands, said method comprising the steps of:
>
> selecting a sub-group of geometric elements corresponding to a structural element of said object, wherein said geometric elements are defined by a set of said design commands;
>
> generating a replication command having replication parameters defined as variables, said replication parameters being generated in relation to said sub-group of geometric elements;
>
> incorporating said replication command and said replication parameters into a design program thereby

generating a generic design program and storing said generic design program, wherein said replication command is stored in an unexecuted form so that when it is desired to replicate said set of design commands to generate a model having a number of said structural element, said number is variable.

The examiner relies on the following references:

HP-DESIGN (HP 98355A), Technical Description Nov. 1984.

AutoCAD Release 10 Reference Manual (September 1988), pages 121-124.

HP-DESIGN discloses a 2-dimensional (2-D) design system using variation design, which enables the designer to enter a geometrical sketch without inputting coordinate values. The dimensions are assigned numerical values later using the ACTUAL design module (see the two examples under the heading "Actualisation"). "The variation design feature of HP-DESIGN makes it possible to produce any variant of an existing design simply by modifying the numerical dimension values." (Heading "Variation Design.") The geometry of standard parts, such as nuts, can be stored as a picture element (macro) in a picture library created by the user using the PICLIB design module. "These macros can then be recalled and inserted into an object, so saving the time needed to recreate commonly used parts." (Heading "Picture Libraries.")

AutoCAD discloses a replication command called ARRAY. "The ARRAY command allows you to make multiple copies of selected objects in a rectangular or polar (circular) pattern." (Page 121, sec. 5.2.7). After entering the ARRAY command, the user is prompted to select objects to be duplicated (such as the

line and circle at the bottom of page 121) and then to choose either a rectangular or polar array. For a polar array, the user defines the center point of the array, the number of items in the array, and the angle between items in the array (or the angle to fill with objects) (pages 123-24, sec. 5.2.7.2).

Claims 1-16 stand rejected under 35 U.S.C. § 103 as being unpatentable over HP-DESIGN and AutoCAD.

The examiner's rejection is contained in the Final Rejection (Paper No. 20) and the Examiner's Answer (Paper No. 25). Appellant's position is set forth in the Brief (Paper No. 24).

OPINION

Grouping of claims

Appellant defines two groups of claims (Brief, page 10):
(1) claims 1-15 are stated to stand or fall together; and
(2) claim 16 is stated to stand alone. Claim 1 is taken as representative of claims 1-15.

Claims 1-15

The level of ordinary skill is not argued, so we find the references to be representative of the level of ordinary skill in the art. See In re Oelrich, 579 F.2d 86, 91, 198 USPQ 210, 214 (CCPA 1978) ("the PTO usually must evaluate both the scope and content of the prior art and the level of ordinary skill solely

on the cold words of the literature"); In re GPAC Inc., 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995) (the Board did not err in adopting the approach that the level of skill in the art was best determined by the references of record). In addition, those of ordinary skill in the art must be presumed to know something about the art apart from what the references expressly disclose. In re Jacoby, 309 F.2d 513, 516, 135 USPQ 317, 319 (CCPA 1962).

HP-DESIGN discloses a CAD system having a two-step operation of first, the entry of variable dimensions (a symbolic value or label representing certain dimensions, such as L3, L4, L5, and D6 under the heading "Actualisation" in HP-DESIGN), and second, the replacement of such variable by an actual numerical value to create the actual part. HP-DESIGN is apparently representative of the admitted prior art (specification, pages 2-3) and appellant admits that "the HP-DESIGN reference has a capability known in the art as 'variable dimensioning' by which certain dimensions can be designated as variables" (Brief, page 12). Therefore, HP-DESIGN discloses generating a generic program of a graphical model of a 2-D object with at least partially variable dimensions in a CAD system having design commands.

HP-DESIGN discloses user selection of a macro representing an object to be duplicated by name or by picking the element from

a picture library (under "Picture Libraries"). Appellant argues that "it is clear that the macros in question refer only to single elements, rather that [sic] a 'sub-group of geometric elements' as called for by Claim 1" (Brief, page 12). However, the macro for a standard part in the picture library, such as a nut, is composed of a plurality of geometrical elements (such as points, lines, circles and arcs, etc. listed under the heading "Defining the Geometry") and, therefore, the macro constitutes a "sub-group of geometric elements corresponding to a structural element of said object" as recited in claim 1. Nevertheless, while the macros can be "repetitively used in a final design" (Examiner's Answer, page 3), the macros must apparently be selected one at a time by a user: there is no description of a replication command having a variable number as recited in the last subparagraph of claim 1. Thus, the macros in HP-DESIGN are provided for replication, but not replication a number of times by a replication command.

The examiner applies AutoCAD as teaching a replication command. The ARRAY command in AutoCAD operates to replicate a selected sub-group of geometric elements. The "Select objects" prompt at page 121, sec. 5.2.7, corresponds to appellant's SELECT ELEM step in the flowchart of appellant's figure 8 and to the claimed step of "selecting a sub-group of geometric elements

corresponding to a structural element." For example, the user may select the line and circle objects for the rectangular array example, pages 121-22, sec. 5.2.7.1, or the circle with center lines for the polar array example, page 124, sec. 5.2.7.2. Thus, both HP-DESIGN and AutoCAD disclose replication of a group of geometric elements corresponding to a structural element. In HP-DESIGN the replication is done one at a time by a user whereas AutoCAD provides for automatic replication a variable number of times using a replication command.

The polar (circular) ARRAY command in AutoCAD (corresponding to appellant's ROTATE replication command 43d in figure 8) has parameters of the center point of the array (corresponding to the CENTER POINT parameter 44b in figure 8), the number of items in the array (corresponding to the REPEAT_FACTOR parameter 44a in figure 8), and the angle between items in the array (corresponding to the ANGLE parameter 44c in figure 8) (AutoCAD alternatively allows a user to specify the angle to be filled instead of the angle between items). Thus, the polar ARRAY command in AutoCAD is a replication command having element selection and replication parameters identical to appellant's disclosed ROTATE replication command. The difference between the subject matter of claim 1 and AutoCAD is that AutoCAD immediately executes the replication command generated by the user, requiring

the user to specify numerical values for the parameter variables, whereas the claimed replication command is stored in an unexecuted form with the parameters as variables which can be assigned later. We do not agree with appellant's finding that the ARRAY command in AutoCAD "does not perform the step of generating a replication command having replication parameters defined as variables" (Brief, page 14). The user apparently "generates" the replication command in appellant's method by typing in the command just as in AutoCAD and the parameters of the ARRAY command (select objects, center point, number of items, angle) exist as variables in AutoCAD until they are assigned numerical values by the user. The difference is that AutoCAD requires the variables to be assigned values immediately after the ARRAY command is generated by the user, whereas the replication command is stored in unexecuted form in claim 1 and the variables are input at the time the command is executed. In our opinion, the obviousness question is whether it would have been obvious to one of ordinary skill in the art to store the ARRAY command of AutoCAD in unexecuted form as part of a generic program so that the values are assigned to the parameters at a later time.

The examiner's position is "that HP-DESIGN, by showing the ability to produce an underconstrained design program in which

dimensions may be left unspecified, contains a direct suggestion that a parameter such as AutoCAD's repetition number may be another of these unspecified parameters in a 'generic design program'" (Examiner's Answer, page 9). We agree. HP-DESIGN recognized the benefit of variant design, that is, of producing a variant of a generic design, represented by design commands, by storing a generic design with design commands having parameters defined as variables and assigning numerical dimension values to the parameter variables when creating an actual variant (i.e, at the time the generic design program is executed). In our opinion, HP-DESIGN would have suggested to one of ordinary skill in the art that any design command having parameters that vary in creating an actual design variant could have been stored in unexecuted form with its parameters defined as variables which are assigned values during the creation of the actual variant. The artisan in the art of designed CAD systems would have had sufficient skill and experience to recognize that the ARRAY replication command in AutoCAD could be incorporated as a design command in other CAD systems such as HP-DESIGN to provide additional design flexibility. Accordingly, we agree with the examiner's conclusion that (Examiner's Answer, page 4):

> It would have been obvious to a person having ordinary skill in the art at the time of appellant's invention to create a "generic design program" without a full set of

> specified parameters, as in the variational dimensioning possible in HP-DESIGN, with the set of geometric specification functions requring [sic] a variable also including the ARRAY command of AutoCAD (without repetition number specified), because this enhances the instruction set of HP-DESIGN to include not only variable dimensions but variable numbers of repetitions as well.

Stated differently, it would have been obvious to one of ordinary skill in the art of designing CAD systems to store the ARRAY command of AutoCAD in unexecuted form with the parameters left as variables, or partly assigned, given the teaching of HP-DESIGN of storing other types of design commands in unexecuted form with the parameters left as variables. The ARRAY command could be stored as an instruction of the generic design program: when the program is executed, the CAD system would respond as if the command had been typed in by the user and would ask for the same parameter information shown in AutoCAD. It is again noted that the difference between the subject matter of claim 1 and AutoCAD is that AutoCAD discloses the ARRAY command being executed immediately, whereas claim 1 requires the command to be stored and executed later.

Appellant argues that the AutoCAD reference cannot be modified to provide variable replications, referring to the declaration under 35 U.S.C. § 132 by appellant, Prof. Dr. Roller. Prof. Dr. Roller's declaration states (pages 1-2):

> The AutoCAD Release 10 reference cannot be modified to provide variable replications because it provides no entry for a variable number of replications during the design step, and consequently no processing means for replacing said variable number by actual values during the creation of an actual variant. Thus, the topology will already be frozen during the design step; leaving the number of replications blank during the design step would produce an error message, and even if the system would be modified to accept a blank number of replications, it could not process the same during the creation of an actual variant, as it does not include instructions to alter the topology - it would even not request the number of actual replications from the user during the creation of an actual variant.

Declarant ignores the obviousness reasoning. It is true that the values for the parameter variables in AutoCAD must be immediately assigned by the user at design time, as disclosed, and that one could not enter a variable symbol instead of a number in response to one of the prompts. AutoCAD, as disclosed, is an interactive CAD system wherein commands are immediately processed and numerical values are assigned for parameter values. AutoCAD, as disclosed, does not describe storing design commands to be executed at a later time. However, the obviousness rejection reasons that it would have been obvious for the ARRAY command to be stored as part of a generic design program with the parameters (which are variables until values are assigned to them) left unspecified in view of the teaching in HP-DESIGN that design commands can have dimension parameters defined as variables. The examiner is correct in stating that no modification needs to be

made to AutoCAD's ARRAY command "because it is specifically provided to give a designer the ability to enter a variable number of repetitions as an operand--this number is not initially 'predetermined'" (Examiner's Answer, page 10). The question is whether it would have been obvious to store the ARRAY command as part of a generic design program without specifying the values for all the parameters, and executing the command when creating an actual variant. We conclude that the answer is yes in view of the generic design program teachings of HP-DESIGN.

Prof. Dr. Roller's declaration further states (page 2):

> Modification according to the teaching of HP DESIGN would result in a system which is able to process variable dimensions, as well as fixed replications (AutoCAD teaching), but would still not comprise
>
> a) a procedure for entering variable replications during the design step,
>
> b) means for replacing the variable number of replications by actual values during the step of creating an actual variant,
>
> c) means for altering the topology during creation of an actual variant.

Again, declarant does not address the obviousness reasoning and the statements are unpersuasive for reasons stated supra.

Appellant argues that the examiner engaged in impermissible hindsight and that there is no suggestion for making the proposed modifications (Brief, pages 17-18). We disagree. HP-DESIGN

provides a suggestion to one skilled in the art to store design commands having parameters defined as variables that can be assigned values when the program is executed.

For the reasons stated above, we conclude that the examiner has established a prima facie case of obviousness which has not been rebutted. The rejection of claims 1-15 is sustained.

Claim 16

Claim 16 is similar to claim 1 except that it adds the following phrase at the end of the "generating" step: "wherein said step of generating said replication command comprises matrix mapping said set of design commands." The examiner states (Examiner's Answer, pages 8-9):

> [T]he multi-segmented interactive display screen of HP-DESIGN can be viewed as a "matrix", with "mapping" to various commands defined therein. . . . Every user-interactive region on the HP-DESIGN screen can be interpreted as one designating "design commands" and thus "matrix mapping" can be given the reasonably broad interpretation to include interactive screen interfacing as in HP-DESIGN.

Appellant argues that the examiner is engaging in hindsight (Brief, pages 18-19). We understand the examiner's position that claims must be given their broadest reasonable interpretation and that limitations from the specification must not be read into the claims. We further appreciate that "matrix mapping said set of design commands" does not define what is meant by matrix mapping.

However, it appears that the examiner has made up an interpretation of HP-DESIGN to fit the claim language, which we consider to be unreasonable. We do not see how HP-DESIGN can be fairly said to show a matrix mapping relationship between design commands and replication commands. The specification defines matrix mapping as using a matrix to transform the points used in a design command to a point in a replication command through translation or rotation matrices (e.g., specification, pages 12-14) and we construe the claim limitation to have this meaning. Neither HP-DESIGN nor AutoCAD discloses matrix mapping as described in the specification. Thus, we reverse the rejection of claim 16.

It was well known to use a transformation matrix to perform translation, scaling, and rotation of 2- and 3-D points. See Foley et al., Computer Graphics Principles and Practice (2d ed. 1990), pages 204-210 (copy attached) (this book is not prior art and we do not have the 1982 edition of this book; however, the same transformations should be found in any book on computer graphics before 1989). Note that the difference between, for example, the transformation on lines 2-4 of appellant's specification and equation 5.1 in Foley is the use of row vectors and premultiplication by appellant, which is merely a different convention. As Foley notes (page 205): "We caution the reader

that some graphics textbooks, including [FOLE82], use a convention of premultiplying matrices by row vectors, rather than postmultiplying by column vectors." We leave it to the examiner to decide whether it would have been obvious to implement replication commands using matrix transformations.

CONCLUSION

The rejection of claims 1-15 is sustained.

The rejection of claim 16 is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

KENNETH W. HAIRSTON Administrative Patent Judge	)
ERROL A. KRASS Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
LEE E. BARRETT Administrative Patent Judge	)

John P. Donohue, Jr.
WOODCOCK, WASHBURN, KURTZ, MACKIEWICZ,
and NORRIS
One Liberty Place - 46th Floor
Philadelphia, PA 19103